

## A new subspecies of *Morpho (Grasseia) godartii* Guérin-Méneville, [1844], discovered in sub-humid forests from southern Bolivian Andes (Lepidoptera, Nymphalidae)

by Patrick BLANDIN\* & Yuvinka GARECA\*\*

\*Muséum national d'Histoire naturelle, Entomologie, 57 rue Cuvier, CP 135, F – 75005 Paris <blandin@mnhn.fr>

\*\*Museo de Historia Natural Alcide d'Orbigny, Entomologia. CP4324. Av. Potosi N°1458 (esq. Av. América), Cochabamba, Bolivia <yuvinkagar@yahoo.com>

**Summary.** – Populations of *Morpho godartii* have been discovered in the Southern Andean Yungas of Bolivia, a region poorly known entomologically. These populations inhabit sub-humid and semi-deciduous forests. Considering male and female habitus, they are clearly different from the nominate *M. godartii godartii* populations, which live in rainforests along the northern Bolivian Andes. They also differ from *M. godartii lachaumei* Blandin, 2007, restricted to the upper Río Beni basin. Consequently, these southern populations are described as a new subspecies, *Morpho (Grasseia) godartii titogilberti* n. ssp.

**Resumen.** – Una nueva subespecie de *Morpho (Grasseia) godartii* Guérin-Méneville, [1844], descubierta en los bosques subhúmedos del sur de los Andes bolivianos (Lepidoptera, Nymphalidae). Poblaciones de *Morpho godartii* han sido descubiertas en los Yungas del Sur en Bolivia, la cual es una región poco conocida, desde un punto de vista entomológico. Estas poblaciones ocurren en bosques subhúmedos y semideciduos. Teniendo en cuenta las formas de machos y hembras son claramente diferenciados de las poblaciones de la subespecie nominata *M. godartii godartii*, la cual vive en bosque lluvioso a lo largo de los Andes bolivianos. Las poblaciones sureñas también difieren de *M. godartii lachaumei* Blandin, 2007, la cual está restringida al área de la cuenca alta del río Beni. En consecuencia serán descritas como una nueva subespecie, *Morpho (Grasseia) godartii titogilberti* n. ssp.

**Résumé.** – Une nouvelle sous-espèce de *Morpho (Grasseia) godartii* Guérin-Méneville, [1844], découverte dans les forêts sub-humides du sud des Andes boliviennes (Lepidoptera, Nymphalidae). *M. godartii* est une espèce décrite de Bolivie, bien représentée dans les collections. En réalité, pendant près d'un siècle et demi, les collectes ne furent effectuées que dans les forêts ombrophiles de la région qui s'étend le long des versants nord des Andes boliviennes. Plus au sud, les versants, orientés vers l'est, sont plus secs, et l'on y rencontre des forêts subhumides, voire semi-décidues. En 1984, un mâle de *M. godartii*, présentant un habitus assez original, avait été capturé dans cette région par un entomologiste français. Beaucoup plus récemment, d'assez nombreux mâles et femelles ont été collectés par plusieurs entomologistes boliviens. Ils diffèrent clairement de *M. g. godartii*, par leur couleur bleue du dessus des ailes, plus intense, plus profonde, et par la face ventrale plus sombre et plus contrastée. En outre, la variabilité individuelle est faible, alors qu'elle est très prononcée chez *M. g. godartii*, où l'on observe une gamme continue depuis des spécimens particulièrement pâles jusqu'à des spécimens au bleu-mauve un peu soutenu et à face ventrale un peu contrastée, moins toutefois que chez les populations du sud. Par ailleurs, celles-ci diffèrent nettement de la sous-espèce *M. g. lachaumei* Blandin, 2007, inféodée au bassin supérieur du río Beni. Une nouvelle sous-espèce est en conséquence décrite, *Morpho (Grasseia) godartii titogilberti* n. ssp. La discussion souligne l'intérêt des forêts subhumides de Bolivie, encore très insuffisamment explorées d'un point de vue entomologique. Elle pose aussi la question de la transition entre *M. g. godartii* et la nouvelle sous-espèce, dans la région de passage des forêts ombrophiles aux forêts subhumides, au sud-ouest de la ville de Santa Cruz.

**Keywords.** – Lepidoptera, Nymphalidae, Morphinae, Morphini, *Morpho*, taxonomy, new subspecies, subhumid semi-deciduous forests, sub-humid Bolivian Tucuman forests, Southern Andean Yungas, Bolivia.

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The Bolivian *Morpho (Grasseia) godartii* Guérin-Méneville, [1844] was the first *Morpho* species described from an Andean country, following a few species collected in the Guianas and in south-eastern Brazil, which were described by Linnaeus, Cramer, Schaller and Fabricius in the 18<sup>th</sup> Century, Esper, Hübner and Dalman at the beginning of the 19<sup>th</sup> Century. The holotype of *M. godartii* is a male, housed in the Natural History Museum

(London); it is labelled “Bolivia”. To our knowledge, for decades, no other specimen was collected, until Otto Garlepp and subsequently Anton H. Fassl travelled in the upper basin of the río Beni (Yungas del Norte, department La Paz), between 1893 and 1912. FRUHSTORFER (1912-1913), treated *godarti* [sic] as a subspecies of *M. menelaus* (Linnaeus, 1758). His text was very short and imprecise, but he noted the existence of females from Coroico (Yungas del Norte) having red submarginal spots.

During the first decades of the 20<sup>th</sup> Century, *M. godartii* was collected by Joseph Steinbach in the area of Buena Vista (department Santa Cruz). Having studied specimens from Garlepp, Fassl and Joseph Steinbach, LE MOULT & RÉAL (1962, 1963) described several individual, seasonal and altitudinal forms. At the end of the 1960s, one of us (P.B.) received specimens collected in Buena Vista area and in Chapare, near Todos Santos and along the road to Cochabamba, by Francisco Steinbach, the eldest son of Joseph. A first attempt was made to clarify the somewhat confused taxonomic situation created by Le Moulton and Réal (BLANDIN, 1970).

In his checklist, LAMAS (2004) considered *godartii* as a subspecies of *M. menelaus*. BLANDIN (2007a) did not follow this point of view, and treated *godartii* as a polytypic species inhabiting Andean foothills and low mountain forests, between approximately 300 m and 1500 m a.s.l., from Bolivia to the area of Mocoa, in southern Colombia. Within Bolivia, BLANDIN (2007a) considered that *M. godartii godartii* extends from the region of Buena Vista, near the town of Santa Cruz, to the north-west in direction of Peru, but he separated the populations from the valleys of the upper basin of the río Beni as *M. godartii lachaumei*, principally because of female characteristics, among which the frequent reddish colour of submarginal spots, noted by FRUHSTORFER (1912-1913).

In the 1980's, Gilbert Lachaume made several trips in Bolivia. On the 27<sup>th</sup> February, 1984, travelling from Sucre to Camiri, between Muyupampa and Aratíal (Chuquisaca department), he observed a male and a female of *M. godartii* flying along the road. He collected the male, but unfortunately missed the female. This male, now kept in MNHN, was illustrated by BLANDIN (2007b), who attached it to *M. godartii godartii*, despite the fact that the intense purple blue of this specimen appeared as an extreme of the known variability in the nominate subspecies.

Since 2004, several males and females have been collected, by various collectors and one of us (Y.G.), in different localities of Chuquisaca and Santa Cruz departments. In 2008, Tito Vidaurre collected the most important local series (15 males and 7 females), in the province Cordillera (Santa Cruz department). The males are similar to the male collected by Gilbert Lachaume, and differ from *M. g. godartii* and *M. g. lachaumei* males. Similarly, the females clearly differ from *M. g. godartii* and *M. g. lachaumei* females. Obviously, these specimens represent a new subspecies.

**Abbreviations.** – **ACB**: Areas Claves de Biodiversidad; **MHNC**: Museo de Historia Natural Alcide d'Orbigny, Cochabamba, Bolivia; **MHNNKM**: Museo de Historia Natural Noel Kempff Mercado, Santa Cruz, Bolivia; **MNHN**, **PMB**: Muséum national d'Histoire naturelle, coll. P. Blandin, Paris, France.

### *Morpho (Grasseia) godartii titogilberti* n. ssp.

**HOLOTYPE**: ♂, Inkahuasi, camino a Yaguaroque (19°51'36"S, 63°49'35"W, 1307 m), dpt. Santa Cruz, Bolivia, 15.III. 2008, *Tito Vidaurre leg.* (MHNNKM 21338).

**PARATYPES** (25♂, 9♀): 1 ♂, route Sucre-Camiri, km 390, entre Muyupampa et Aratíal (19°53'33"S, 63°43'56"W, 1100 m), prov. Luis Calvo, dpt. Chuquisaca, Bolivia, 27.II.1984, *Gilbert Lachaume leg.* (MNHN, PBM 926); 14 ♂, 7 ♀, *idem* holotype (MHNNKM 21336, 21337, 21339 to 21350, and 21357, 21358, 21360 to 21362, and 1 ♀, donated to MNHN); 9 ♂, 2 ♀, Parabano (18°25'25"S; 63°29'10"W,

1100 m), prov. Cordillera, dpt. Santa Cruz, 23-27.III.2004, *Jose Luis Aramayo, Ivan Garcia, Alejandra Valvidia, Patricia Caballero, Saul Rojas leg.* (MHNNKM 5658, 5645, 5663 to 5667, 5670, 5671 and 5625, 5681); 1 ♂, Manchones (18°45'8,76"S, 64°0'30,72"W, 1695 m), prov. Vallegrande, dpt. Santa Cruz, Bolivia, 12.IV.2011, *Yuvinka Gareca leg.* (MHNC 000-4951).

The paratypes have been selected amongst specimens from localities representing the two ecosystems where *titogilberti* populations have been sampled. The other collected specimens are the following: 1 ♂, Río Los Pinos (19°43'35"S, 63°55'3,5"W, 1300 m), prov. Hernando Siles, dpt. Chuquisaca, Bolivia, 18.IV.2004, *Proyecto ACB leg.* (MHNNKM 4127YG); 3 ♂, Ticucha (19°36'15,2"S, 63°53'11,2"W, 1400 m), prov. Luis Calvo, dpt. Chuquisaca, Bolivia, 9.IV.2004, *Proyecto ACB leg.* (MHNC 076YG and MHNC 5569, 5667); 1 ♂, Samaipata, Cuevas (18°12'28"S, 63°43'32"W; 1509 m), prov. Florida, dpt. Santa Cruz, 21.II.2007 (MHNNKM 21356); 2 ♂, La Guitarra (18°6'10,15"S, 63°32'38,4"W), prov. Andres Ibañez, dpt. Santa Cruz, 1-9.III.2006, *Ivan Garcia leg.* (MHNNKM 5656, 5659); 4 ♂, Espejillos (17°55'53,15"S, 63°23'40,11"W, 162 m), prov. Andres Ibañez, dpt. Santa Cruz, Bolivia, 9-20.I.2008, *Daniel Galindo leg.* (MHNNKM 21351 to 21354).

**Description. Male** (fig.1, 3). – Holotype wingspan: 146 mm (forewing length: 83 mm). In paratypes, the wingspan varies from 113 to 147 mm, the forewing length from 67 to 82 mm.

**Diagnostic characters.** – The male has a deep blue colour, with violet and greenish reflections on the dorsal surface, differing from the mother-of-pearl colour, with pale mauve reflections, exhibited by males of *M. g. lachaumei* and typical males of *M. g. godartii* (fig. 2). The ventral surface has an ochre ground colour with a green-olive tinge, differing from the light “tobacco-chocolate” colour exhibited by the other subspecies.

**Variability.** – In *M. g. godartii*, males vary from bluish specimens with a rather contrasted ventral surface, to others having a very pale habitus, with a faded ventral decoration (fig. 4). In the new subspecies, males are less variable; the figure 3 represents a pale specimen, which nevertheless can not be confounded with males of *M. g. godartii* having a blue colour, as the green-olive tinge remains evident. Nevertheless, in the northernmost populations (Parabano, Espejillos), the green-olive tinge may be faded, and some specimens may be difficult to distinguish from bluish *M. g. godartii*.

**Female** (fig. 5, 7). – The wingspan varies from 130 to 159 mm, the forewing length from 68 to 89 mm.

**Diagnostic characters.** – On the dorsal surface, the distal parts of the wings are dark brown. The metallic colour is a brilliant blue with greenish reflections. The forewing pupillary marks are generally smaller than in *M. g. godartii* females, and submarginal marks, on both wings, are often smaller, less rounded, and more yellow. On the ventral surface, the basic color is dark brown, on which the white, brilliant bands contrast strongly. *M. g. lachaumei* females also have a contrasted ventral surface but, on the dorsal surface, the metallic colour is a weak, translucent, violet; moreover, pupillary and submarginal marks are generally wider than in *M. g. titogilberti*.

**Variability.** – In *M. g. titogilberti*, individual variations are reduced: a pale female is illustrated fig. 7. On the contrary, in *M. g. godartii*, there is an important proportion of females having faded colours which are not the result of bad conservation, existing in freshly collected specimens; an extremely faded specimen is illustrated fig. 8. Even the paler *titogilberti* females may not be difficult to distinguish from the more contrasted females of *M. g. godartii*.

**Etymology.** – The name *titogilberti* is composed in honour of Tito Vidaurre and Gilbert Lachaume. Gilbert Lachaume collected the first specimen of the new subspecies, and Tito Vidaurre collected an excellent sample of both sexes.



Fig. 1-2. – *Morpho godartii*, ♂, recto-verso, Bolivia. – 1, *M. g. titogilberti* n. ssp., holotype, Inkahuasi, dpt. Santa Cruz, (MHNNKM 21338). – 2, *M. g. godartii*, typical specimen, Todos Santos, prov. Chapare, dpt. Cochabamba (300 m) Bolivie, may 1968, J. Steinbach leg. (MNHN, PBM 105).

**Geographic distribution** (fig. 9, 10). – *M. g. titogilberti* has been collected in various localities within the Southern Andean Yungas ecoregion. In Espejillos, Guitara and Parabano, it inhabits sub-humid semi-deciduous forests which belong to the Cerrado Biogeographic Province. There are several associations within these forests, which are a variant of central Brazilian forests. In Samaipata Cuevas, Ticucha and Inkahuasi, *Morpho g. titogilberti* flies in Subhumid Bolivian Tucuman forests of the superior subandean altitudinal belt, which presents a group of semi-deciduous climax forests, distributed in the entire Bolivian-Tucuman Biogeo-



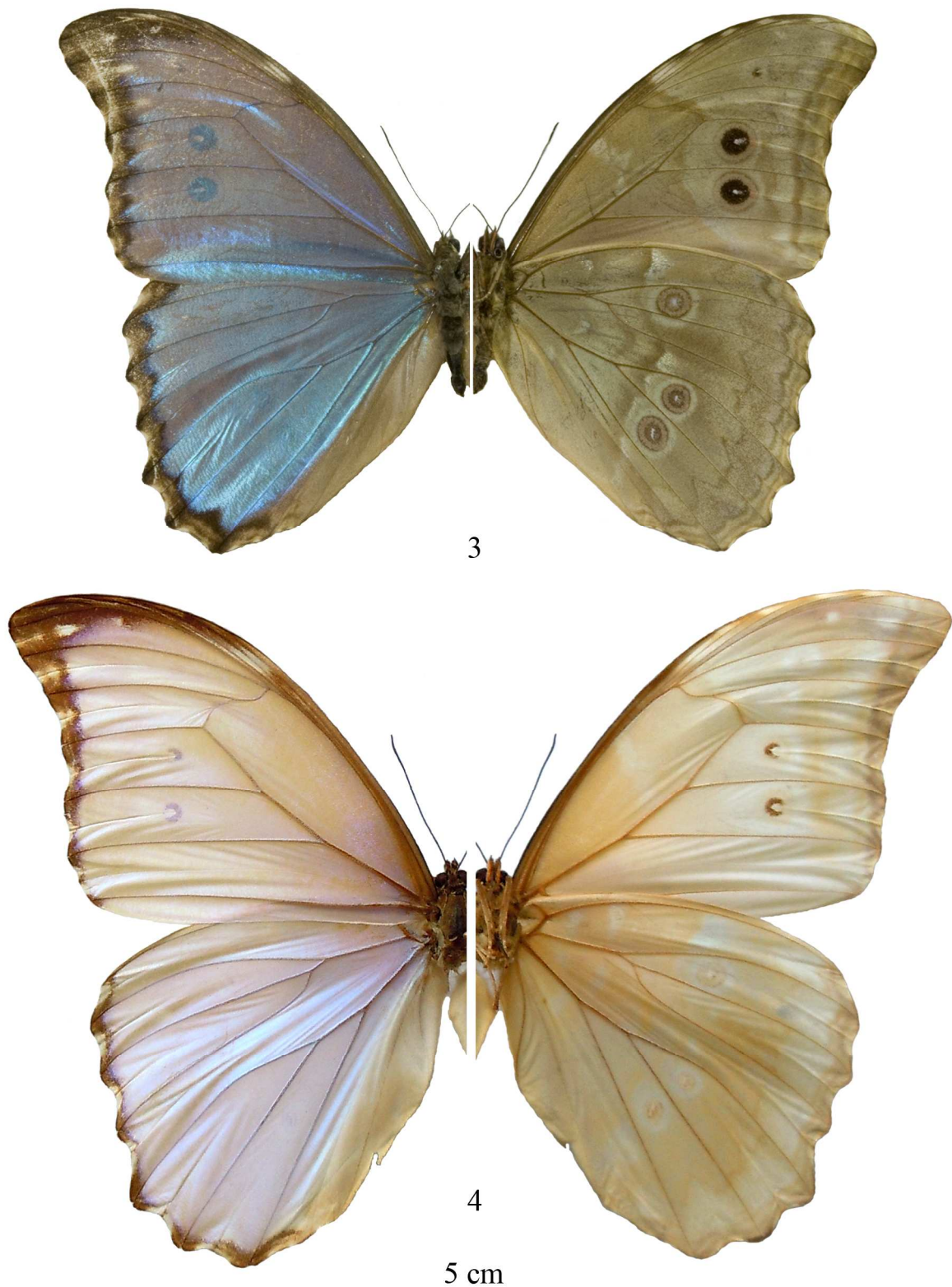


Fig. 3-4. – *Morpho godartii* ♂, recto-verso, Bolivia. – 3, *M. g. titogilberti* n. ssp., paratype, Inkahuasi, dpt. Santa Cruz, (MHNNKM 21341); – 4, *M. g. godartii*, pale specimen, Cristal Mayu, Prov. Chapare, dpt. Cochabamba (600 m), february 1974, J. Steinbach leg. (MNHN, PBM 265).

graphic Province, above about 1000-1400 m depending on latitude and up to 1500-1900 m. The altitudinal range of *M. g. titogilberti* is probably wider than the range of *M. g. godartii*, as it has been encountered from lowlands (less than 200 m in Espejillos), to more than 1600 m (near Manchones), while *M. g. godartii* has been generally between 300 m and 1100 m, and only on rare occasions higher (BLANDIN, 2007a).





Fig. 5-6. – *Morpho godartii*, ♀, recto-verso, Bolivia. – 5, *M. g. titogilberti* n. ssp., paratype, Inkahuasi, Dpt. Santa Cruz, (MHNNKM 21360); – 6, *M. g. godartii*, typical specimen, Buena Vista, Prov. Ichilo, Départ. Santa Cruz (400 m), april, J. Steinbach leg. (MNHN, PBM 110).

#### DISCUSSION

The discovery of *M. g. titogilberti* illustrates the entomological interest of the Southern Andean Yungas of Bolivia, where forest ecosystems are different from the rainforests existing along the northern slopes (NAVARRO & FERREIRA, 2008). In the same region, a new subspecies



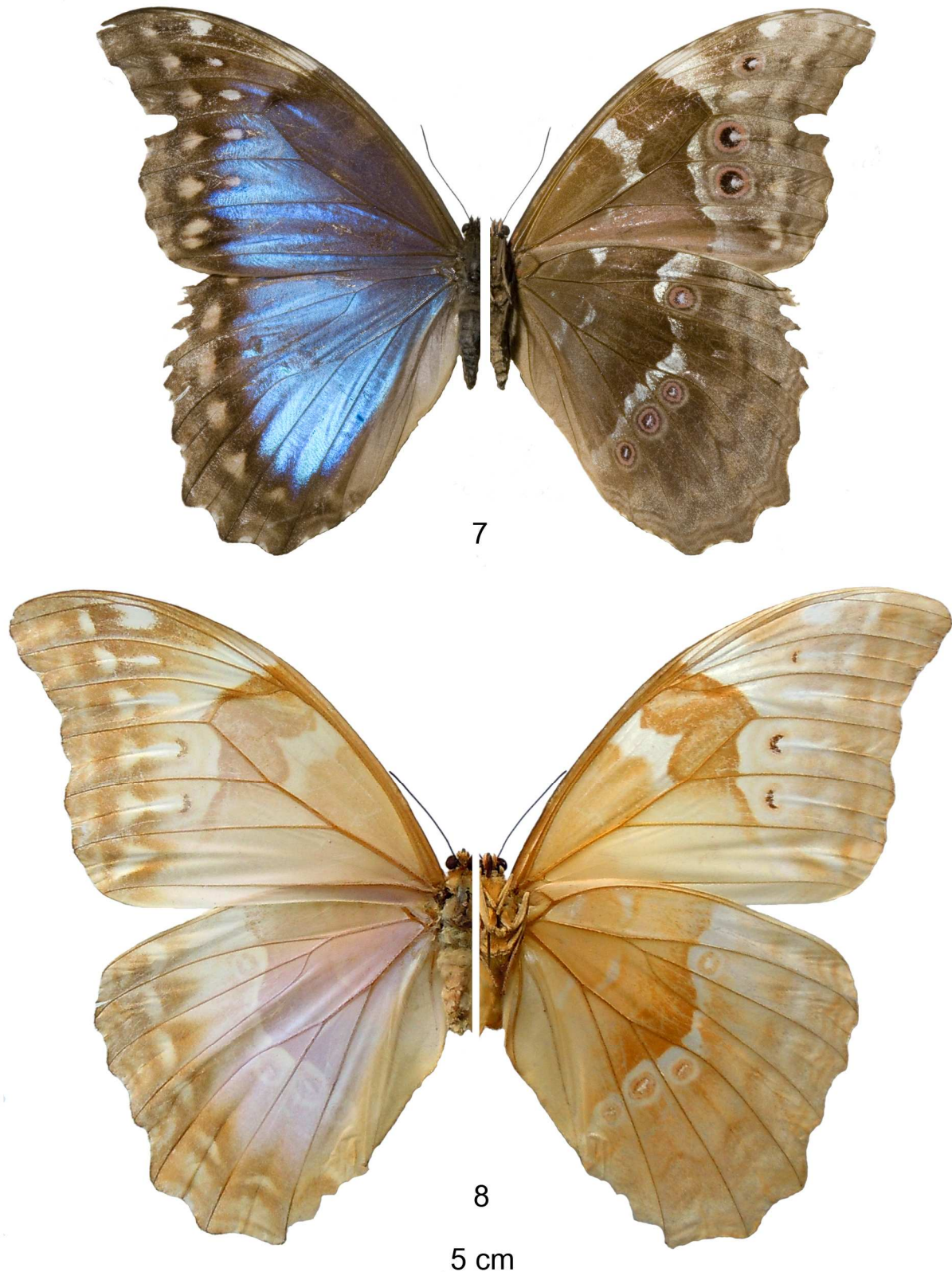


Fig. 7-8. – *Morpho godartii* ♀, recto-verso, Bolivia. – 7, *M. g. titogilberti* n. ssp., paratype, Inkahuasi, dpt. Santa Cruz, Bolivia, (MHNNKM 21358); – 6, *M. g. godartii*, pale specimen, Cesarsama (300 m), 1978, N. Kuscevic leg. (MNHN, PBM 546).

of *M. helenor* was also discovered (GARECA & BLANDIN, in press). In the present state of knowledge, we can not affirm that *M. godartii* and *M. helenor* are the unique *Morpho* species inhabiting the southern sub-humid forests. However, this is possible: several collecting trips have been organized, but no additional species have been observed. From a biogeographic and ecologic point of view, it should be interesting to compare the butterfly faunas of this region and of the rainforests of the Santa Cruz Department, in order to check

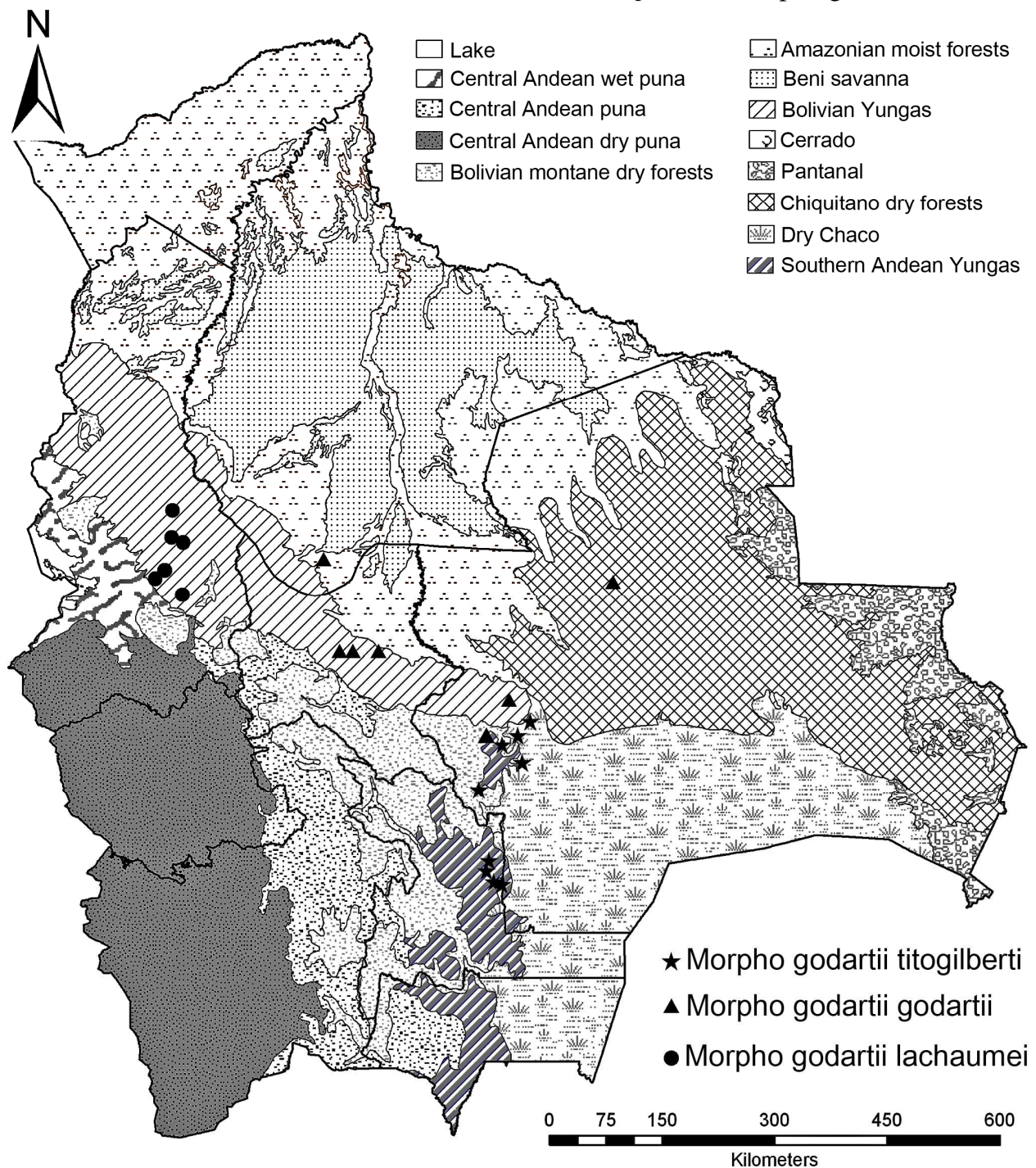


Fig. 9. – Geographic distribution of Bolivian subspecies of *M. godartii* in relation with ecoregions. Ecoregions are designed according to <http://www.worldwildlife.org/science/ecoregions/terrestrial.cfm>

the hypothesis of a southwards decrease of species diversity and to determine which rainforest species are able to inhabit drier ecosystems.

The Andean slopes present a very complex geomorphology, notably to the south-west of the town of Santa Cruz, because the general orientation of the mountain ridges changes dramatically. Consequently, local ecologic conditions are highly variable, resulting in a mosaic of ecosystems (fig. 10). For example, the lowland locality Espejillos, at the north of *M. g. titogilberti* area, has evident affinities with respect to the Bolivian-Tucuman Biogeographic Province, as supported by the presence of a frog species very typical of this Province (Steffen Reichle, pers. comm.). In this context, the transition between *M. g. godartii* and *M. g. titogilberti* is also probably complex. It is possible that morphologically intermediate populations exist. Moreover, it is not impossible that different ecotypes of *M. g. titogilberti* inhabit different ecosystems. For example, the specimens from the sub-humid forests of the Cerrado



Biogeographic Province are paler than the specimens from the sub-humid, semi-deciduous forests of the Bolivian-Tucuman Province. Nevertheless, on the whole, the variability within *M. g. titogilbereti* is much more reduced than the variability within *M. g. godartii*.

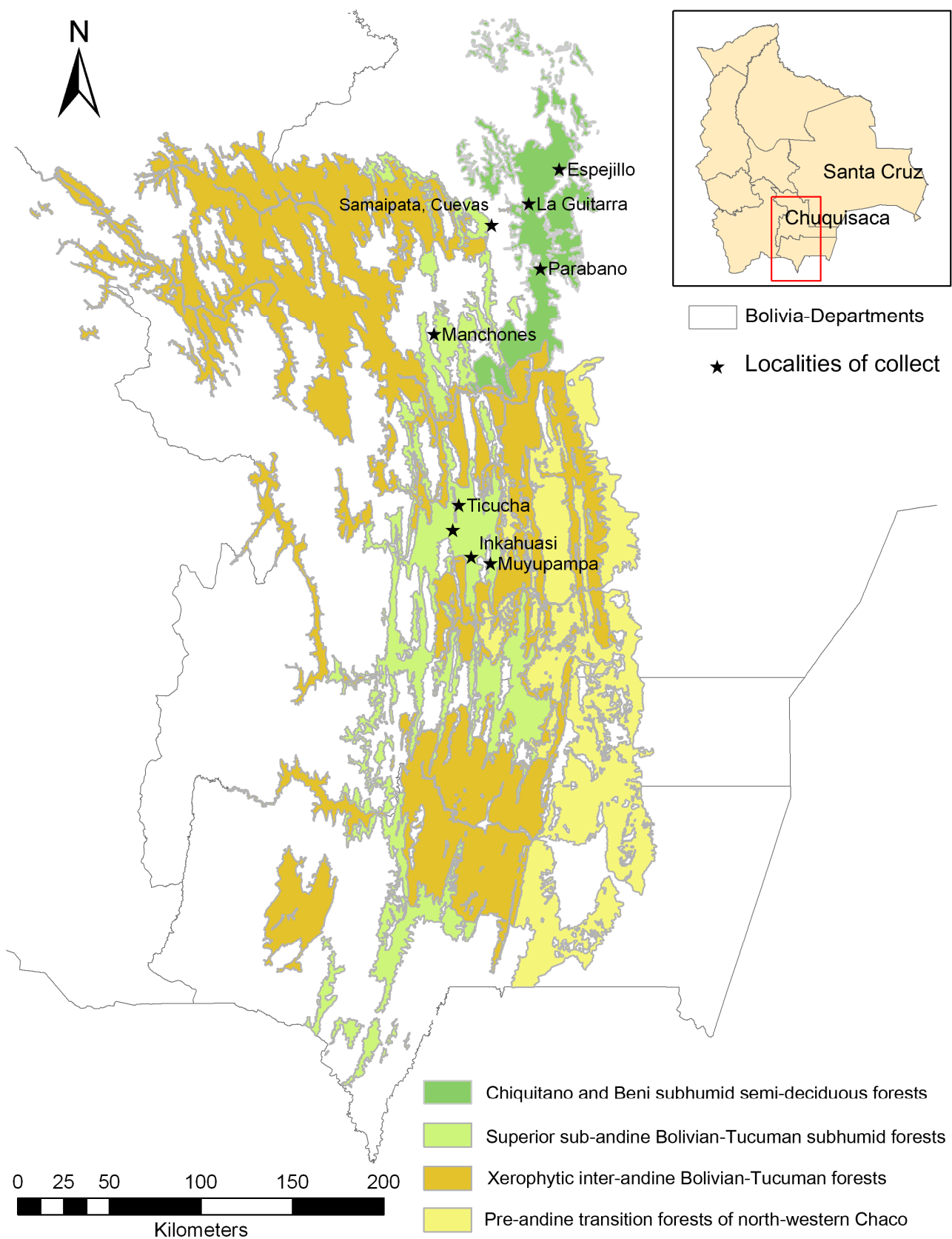


Fig. 10. – Distribution of *M. godartii titogilbereti* in relation to the ecosystems of the Southern Andean Yungas. Ecosystems are designed according to NAVARRO & FERREIRA (2008).

## CONCLUSION

For more than a century, the collecting of butterflies, in Bolivia, was concentrated in the rich rainforests of the northern Andean slopes. Two decades after the first capture, in 1984, of a *M. godartii* male in the Chuquisaca department, several trips in the Southern Andean Yungas produced a large number of males and females, which confirmed the existence of populations differing from the “classical” *M. g. godartii*. Today, it may be important to explore other localities, towards Argentina, in order to characterize the southern limit of this new subspecies, *M. g. titogilberti*. To the north, detailed field studies are required in order to understand the geographic and ecologic transition between *titogilberti*, adapted to sub-humid forests, and the rainforest nominate subspecies. A first biological study on a population from the basin of the río Beni was recently realized (GUERRA-SERRUDO & LEDEZMA-ARIAS, 2008); a similar, comparative study on *M. g. titogilberti* should be of great interest.

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